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14. ABSTRACT

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In 2012, General Martin Dempsey, the current Chairman of the Joint Chiefs of Staff, published the Capstone Concept for Joint Operations: Joint Force 2020. Many of the operational requirements and capabilities the Joint Force 2020 describes assume and rely on concepts that are akin to NCW. Revitalizing concepts of NCW will be necessary to best manifest the Chairman of the Joint Chiefs of Staff's vision of the Joint Force 2020.

The question is, if Joint Force 2020 is the future, then why is NCW not referenced in the Joint Force 2020? Though initially NCW's core concepts were seen as implausible, technology has evolved, and the application of technology in all domains suggests that technology will continue to evolve. Building on the evolution of technology, the Joint Force 2020 is advocating transformational concepts, such as a reinvigoration and codifying of mission command to increase both effectiveness and efficiency of forces. The coupling of technology with an indoctrination of mission command philosophy will make evident that the principles of NCW are the theoretical base for emerging doctrine that can define the Joint Force 2020.

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NETWORK CENTRIC WARFARE AND JOINT FORCE 2020

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A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

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INTRODUCTION

". . . enabling decentralized and distributed formations to perform as if they were centrally coordinated . . ." -General Dempsey[1]

Admiral Arthur Cebrowski and his adherents developed Network Centric Warfare (NCW) in the late nineties. The concept, though ill-defined and nebulous at the time, gained popularity and seemed prophetic of a revolution in military affairs. However, several detractors, and an inability of industry to provide technology that fulfilled the nascent theory, caused the revolutionary spirit and excitement over NCW to dissipate over the past decade.

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[1] General Martin Dempsey *Mission Command* (Washington D.C.: Government Printing Office, 2012): 4.

JOINT FORCE 2020 WILL USE MISSION COMMAND

Joint Force 2020 explicitly endorses the use of mission command as a method to achieve greater adaptability to a changing threat.[2] It is Integral to understand mission command in order to understand the Joint Force 2020's emphasis on using mission command. *Mission Command's* goal is for tactical units to have the ability to act independently of their operational headquarters to achieve end states directed by the commander's intent; without the necessity of an operational headquarters centrally controlling the operation's execution.[3] *Mission Command* continually emphasizes the words decentralized and distributed when referring to the nature of operations requiring mission type orders.[4] The Chairman further explains that the interplay of three fundamental tenets; commander's intent, mission type orders, and decentralized execution; yields mission command.[5] Other aspects, such as trust, need to be present for mission command to blossom.[6]

"Mission command" has supplanted "command and control" in the Army lexicon.[7] Command and control was an easy concept for the Army to grasp. Command is an art. Controlling subordinates through carefully planned command and task organizations is a science. However, *Mission Command* challenges all leaders to "blend the art of command" with "the science of control."[8] This blending is in actuality an adjustment of priority on the behalf of commanders to emphasize command over control. The emphasis on command is to

[2] General Martin Dempsey, *Capstone Concept for Joint Operations: Joint Force 2020* (Washington D.C.: Government Printing Office, 2012): 4-5.
[3] Dempsey, *Mission Command*, 3-4.
[4] Ibid.
[5] Ibid.
[6] Jennifer Free, "Network-Centric Leadership; Why Trust is Essential." United States Naval Institute. *Proceedings* 131, no. 6 (June 2005): 58-60. Accessed March 14, 2014. ProQuest.
[7] Colonel Michael Borg, "Mission Command" (Lecture of Opportunity, Naval War College, Newport, RI, March 5, 2014).
[8] Dempsey, *Mission Command*, 3-4.

address the requirement to distribute forces in multiple domains to execute operations in a decentralized manner. Forces will need a presence across the globe in multiple domains to react more quickly to unpredictable and persistent threats. This force dispersion will deny commanders the comfort of having the same level of control they would have if the forces were closer to the flagpole, either in a physical or relative sense.

The reason for force distribution is that, as the Chairman describes the threat environment in the Information Age of 2020, forces will have to be distributed to address the increase in space and reduction in time.[9] *Mission Command* acknowledges the Information Age's compression of time and expansion of space due to globalization changing the operating environment.[10] To cope with this change in theaters and their structures, *Mission Command* proposes the most effective way to prevent or defeat threats is to decide and execute actions more quickly than any enemy can counter the effects of the actions.[11]

Mission Command, in explaining rapid decision making's ability to prevent enemy action, cited Colonel John Boyd's theory of Observe, Orient, Decide, and Act (OODA Loop). Boyd developed the OODA Loop when he hypothesized that he could win tactical engagements by making decisions and acting on them faster than his adversary could counter his actions.[12] OODA Loop theory adherents essentially reason that, "high and accelerating rates of change have a profound impact on the outcome, 'locking-out' alternative enemy

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[9] Dempsey, *Capstone Concept for Joint Operations: Joint Force 2020*, 1-4.
[10] Commander Erick J. Dahl, "Network Centric Warfare and the Death of Operational Art," *Defence Studies* 2, no. 1 (Spring 2002): 19. Accessed March 21, 2014. ProQuest. "Compression of the levels of war, and even of the elements of space, force, and time are still with us, an information age commander must see and use those elements in ways not anticipated on the linear battlefield of a century ago." Globalization made the world smaller, which requires forces to effect not just their assigned sector, zone, or theater- but the entire globe. The effect of a smaller world is forces may have to cover more actual space.
[11] Dempsey, *Mission Command*, 3-4.
[12] U.S. Marine Corps, *Command and Control.* Marine Corps Doctrine Publication (MCDP) 6.Washington DC: Headquarters U.S. Marine Corps, 1996. 61-63. Accessed April 24, 2014. http://www.fas.org/irp/doddir/usmc/mcdp6.pdf

strategies and 'locking-in' success."[13] This quote, though accurately describing an OODA Loop's ability to limit enemy actions, was actually written to describe how NCW would use information networks to accelerate decision cycles to achieve an edge on the battlefield. The similarities in the concepts and the diction between OODA Loop theory and NCW theory transitively suggest that NCW's concepts are akin to concepts of *Mission Command*, and subsequently to the command organization prescribed in Joint Force 2020.

THE NETWORK OF NCW

Before doing a full synthesis, NCW needs to be defined and better understood. The lack of a clear and consistent definition of NCW is addressed by Erick Dahl, in an article written while serving as a US Naval Commander on the Joint Military Operations faculty at the Naval War College. In his article "NCW and the Death of Operational Art," Dahl argues that the proponents of NCW could not define NCW because it is a minor subset of an overall shift in operational art trying to address the Information Age's effects on operational art.[14] As such, the ambition of NCW proponents to treat NCW as a revolution in military affairs undermined the actual impact technology can have. The potential impacts of technology are flattening command organizations, enabling quicker intelligence dissemination, connecting dispersed units to ensure unity of effort, and a myriad of other organizational changes not related to the information systems and computers used to transmit the data.[15]

The reason for the inability to well define NCW was Admiral Cebrowski's inability to offer a more encompassing understanding of the word "network." In the late nineties,

[13] Admiral (ret) Arthur K. Cebrowski, and John J. Gartska, "Network-Centric Warfare: Its Origin and Future," United States Naval Institute. *Proceedings* 124, no. 1 (January 1998): 28-35. Accessed March 14, 2014. ProQuest.
[14] Dahl, "Network Centric Warfare and the Death of Operational Art," 19-20.
[15] Ibid., 5.

"network," was assumed to relate only to information systems as they pertained to a communications network. Over the past decade, networks have come to be understood as any mesh of connections; whether social, information, communications, or in the military sense, command organizations. NCW rests on Metcalfe's Law, "which asserts that the 'power' of a network is proportional to the square of the number of nodes in the network."[16] Taken in the context of computer and information networks, the law argues that connectivity increases productivity. However, the understanding of network should not be limited to information systems. NCW was unable to clarify this in 1998 because social networks like Facebook or Twitter had not yet demonstrated the capacity of communications systems to enable spontaneous social networks. Facebook and Twitter exert influence not because they are hosted on robust networks of communications architectures, but because they connect distributed and decentralized individual actors and personalities into a social network. In 2003 Admiral Cebrowski addressed this directly, stating that NCW, "is not narrowly about technology, but broadly about an emerging military response to the Information Age."[17] The intelligence community has embraced the notion that people can be nodes in a network, in the oft repeated line of, "don't target the person- target the network."[18]

As such, NCW is not a revolutionary concept that will redefine how war is fought, but rather it is a method to adapt warfighting to the Information Age. Warfighting today

[16] Cebrowski, "Network-Centric Warfare: Its Origin and Future," 28-35.
[17] Admiral (ret) Arthur K. Cebrowski, "Network Centric Warfare," *Military Technology* 27, no. 5 (May 2003): 16-18, 20-22. Accessed April 8, 2014. ProQuest.
[18] Introduced to the Army during the War on Terror, groups such as the Asymmetric Warfare Group began instructing operations and intelligence officers to target enemy networks as opposed to just enemy belligerents. The approach believed that a belligerent could be replaced, whereas damage to an integral node of the network- such as finance or lines of communications- could not be easily overcome by the enemy. The concept was intended to address the resiliency terrorist organizations.

remains a chaotic, complex, adaptive system.[19] The unpredictable chaos of war is why Admiral Cebrowski advocated a networked command organization of the force.[20] A network resembles a mesh structure, with many nodes connecting to many other nodes. As it pertains to command organizations, a network would appear to function in a flatter model as opposed to a pyramid or hierarchy. The flatter model, with its multiple connections at all levels will be more resilient and adaptable to changes.[21] In order to enable this organizational network, the force needs the connectivity that data platforms of the Information Age now offer. In the late nineties and even the early part of the new millennia, mobile computing was in its infancy and not mature enough to be leveraged in the ways it is today.[22] Admiral Cebrowski's confusing discussion of grids and backplanes was his attempt to describe what the commercial market has since institutionalized with app stores, on demand media, GPS enabled moving map programs, unified communications, and every other bell and whistle a smart phone or tablet provides a user.

The early adopters who understood the intent of Admiral Cebrowski have reduced the principle of NCW to the following precepts: "a robustly networked force improves information sharing; that information sharing enhances the quality of information and shared situational awareness (SA); that shared SA enables collaboration and self-synchronization, and enhances sustainability and speed of command, and that finally, all these in turn

[19] Major Christopher D. Kolenda, "Transforming How We Fight: A Conceptual Approach." Naval War College Review 56, no. 2 (Spring 2003): 100-121. Accessed March 6, 2014. 108. Kolenda emphasizes that Chaos Theory and the theory of Complex Adaptive Systems remain relevant throughout time as descriptive of war because the proportion of input to output of a system, allowing the system to adapt in complexity, creates chaos.
[20] Cebrowski, "Network Centric Warfare," 16-18, 20-22.
[21] Concepts such as the routing protocol Open Shortest Path First (OSPF) maximize efficiency in routing through networks as opposed to distant vector routing protocols which cannot account for changes in route patterns.
[22] Cisco Visual Networking Index, "Global Mobile Data Traffic Forecast Update, 2013-2018," accessed April 24, 2014. http://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/white_paper_c11-520862.html.

dramatically increase mission effectiveness."[23] The application of these three parts of NCW; situational awareness, self-synchronization, and speed of command; is what makes NCW so applicable to mission command.

SITUATIONAL UNDERSTANDING AND SHARED CONTEXT

Currently, technologies providing situational awareness capabilities have a stigma that the capability will be used to enable micromanagement.[24] This highlights how situational awareness has been used and perceived as a tool for senior leaders to insert themselves directly into tactical actions, as demonstrated by the Battle of Robert's Ridge.[25] However, used properly, situational awareness addresses the necessity of creating a shared context between various headquarters.[26] Framed as a part of OODA Loops, situational awareness provides the information to create an "observation." It is the "orientation" that drives "decisions" and "actions." Shared context between various headquarters should ensure that involved headquarters are orienting situational awareness the same way, with the

[23] Jack Thackray, "The Holy Grail," in *The Big Issue: Command and Control in the Information Age*, ed. David Potts et al. (Washington D.C.: Command and Control Research Program, 2002), 43-58. Accessed March 16, 2014. http://www.dodccrp.org/files/Potts_Big_Issue.pdf. 48.

[24] Dempsey, *Mission Command*, 7. "No C2 technology has ever successfully eliminated the fog of war, but it can create the illusion of perfect clarity."

[25] Colonel (ret) Andrew N. Milani, "Pitfalls of Technology: A Case Study of the Battle on Takur Ghar Mountain, Afghanistan" (USAWC Strategy Research Project, U.S. Army War College, Carlisle Barracks, PA, 2003). COL (ret) Andrew N. Milani, former member of the 160th SOAR, brought the perils of using technology at the operational level to direct tactical actions to the forefront in his examination of the battle of Takur Ghar he published while attending the Army War College. His case study is cited in multiple works produced in response to NCW that question the practical application of NCW, as the communications network enabled flag officers to micromanage a tactical engagement. The confusion from multiple levels of war exerting control over tactical actions had a direct and negative impact on the operation, and is seen as a case study example of the negatives associated with providing SA technology to higher headquarters.

[26] General (ret) Gary Luck and the JS J7 Deployable Training Division. "Mission Command and Cross Domain Synergy. Insights and Best Practices Focus Paper," March 2013. Accessed March 12, 2014. http://www.dtic.mil/doctrine/fp/mission_command_fp.pdf. 5.

consequence of making decisions and taking actions more quickly.[27] Shared context and situational awareness could also be described as shared situational understanding.

Shared situational understanding can enable on-ground leaders to take the initiative to act on the implicit commander's intent in the absence of a commander's explicit directives. The communications network does not exist, in a NCW construct, for the decision maker to be seated in a joint operations center that resembles the command bridge of a science fiction starship. Rather, the commanders need to have the ability to move into the fog of war, to feel the friction, and exercise their intuition, without the worry of losing connection to the refined information that builds a shared understanding stretching through all levels of war. Furthermore, this coupling of both the intangible elements of being on the ground with the higher common operating picture creates a truer situational understanding of the observations situational awareness provides. Education of leaders should emphasize the primacy of the ground commander and that situational understanding is a combination of awareness, intelligence, and context.

SELF-SYNCHRONIZATION AND UNITY OF EFFORT

Key to shared situational understanding is its application. NCW postulates that networked forces will self-organize and self-synchronize to adapt to and engage the enemy.[28] Self-organization and self-synchronization theorize that units will spontaneously combine

[27] Rob Parker, Chuck Michael, Brian Falk, Joe DiRenzo, and Chris Doane. "The New Knowledge Network." United States Naval Institute. *Proceedings* 139, no 10 (October 2013): 24-29. Accessed March 14, 2014. ProQuest; Dempsey, *Mission Command*, 3-7. *Mission Command* seemingly contradicts itself in advocating commanders to help to "co-create" a shared context, but then warns the produced shared context cannot supersede the intuition of on the ground leaders. The need to affirm the primacy of the decision of the on ground commander comes from poor application of SA tools, where higher commanders want information pushed up, but fail to push higher SA down- essentially taking the tools of Network Centric Warfare but using them in a hierarchical command organization.

[28] Cebrowski, "Network-Centric Warfare: Its Origin and Future," 28-35.

and act in concert to achieve a previously defined end state.[29] Though self-organization and self-synchronization seem to violate unity of command, their application could produce a flat command organization that more closely resembles a network than a pyramid. This flatter command organization could provide the Joint Force 2020 with the agility joint and inter-agency task forces organized along a unity of effort already enjoy.

It is undeniable that some level of central planning is almost always necessary.[30] Regardless, the core concept of self-synchronization should be examined as the acceptance of the utility of the dashed line in a task force's organizational chart. Self-synchronization is a viable and necessary aspect of the joint and inter-agency task forces which operate under a unity of effort, as opposed to a unity of command. The Joint Staff recognizes this, as it is encouraging forces to work, "much more closely with your horizontal mission partners."[31] The ability of forces to self-synchronize is advocated by the Joint Force 2020 in its assertion that, "reliance and synergy of disparate elements to achieve operational objectives is the genesis for a deeply interdependent Joint Force 2020."[32] Examples of units self-synchronizing to achieve unity of effort is seen in the sharing of intelligence and targets between agencies and task forces. Mission partnering between Special Operations Forces (SOF) and General Purpose Forces highlights operational commanders internalizing the theater commander's intent and self-organizing to achieve effects that would normally be pursued by a designated joint task force. The conduct of complimenting operations by these two distinct forces to achieve the effects of a higher commander's desired end state is an example of self-synchronization.

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[29] Ibid.
[30] Barry Rosenberg, "Technology and Leadership," Armed Forces Journal (July 1, 2007): 18. Accessed March 14, 2014. ProQuest.
[31] Luck, "Mission Command and Cross Domain Synergy. Insights and Best Practices Focus Paper," 10.
[32] Dempsey, *Capstone Concept for Joint Operations: Joint Force 2020*, 3.

The efficiency of self-synchronization comes from its exploitation of human nature. People inherently want to organize from the bottom-up, and are able to do so to achieve common goals.[33] Embracing a unity of effort, with its confusing mesh of dashed lines and vague definitions of command and support relationships, can allow joint task forces and agencies to work at the speed of the problem.[34] Decentralized and distributed forces making decisions based on shared intelligence and shared situational understanding is intended to reduce the flash to bang between observation and orientation to decision and action. It is recommended that procurement of technology focus on extending communications networks to the most decentralized and distributed forces to enable self-organization and self-synchronization.

SPEED OF COMMAND AND OODA LOOPS

Forces moving at the speed of the problem by making decisions and taking action faster than the enemy, using OODA Loops to lock the enemy out of the decision cycle, defines speed of command.[35] NCW's shared situational understanding addresses how Joint Force 2020 observes and analyses the enemy and the environment. NCW's self-synchronization and self-organization addresses how Joint Force 2020 can act along informal lines of a unity of effort, orienting itself to the enemy. NCW's concept of the speed of command addresses the decision and action of the OODA Loop.

Speed of command relies on three principles; superior situational understanding yields "Cognitive Dominance," efficient employment of forces in lieu of massing forces can

[33] Nancy J. Wesensten, Gregory Belenky, and Thomas J. Balkin, "Cognitive Readiness in Network Centric Operations." *Parameters* 35, no 1 (Spring 2005): 94-105. Accessed March 14, 2014. ProQuest.
[34] Luck, "Mission Command and Cross Domain Synergy. Insights and Best Practices Focus Paper," 8.
[35] Dempsey, *Mission Command,* 3-4; Cebrowski, "Network Centric Warfare," 16-18, 20-22.

still have massive effects, and rapid actions will consume the enemy in countering the effects of the offense, denying the enemy the ability to plan or conduct branch and sequel operations.[36] More succinctly, NCW's speed of command endeavors to mount an offense that prevents the enemy from responding effectively, which is fundamentally the same goal codified by Boyd in the OODA Loop. As such, this reinforces the thesis of Erick Dahl, that NCW is not a revolution in military affairs inasmuch as a shift in operational art's application in the Information Age.[37]

OPERATIONAL ART IN THE INFORMATION AGE: TECHNOLOGY AND MISSION COMMAND

This shift in understanding operational art and force employment is the crux of what sets the future Joint Force 2020 apart from the current force today. Admiral Cebrowski acknowledged this shift in 1998, stating NCW was, "not just a matter of introducing new technology; this is a matter of the co-evolution of that technology with operational concepts, doctrine, and organization."[38] Since 1998 technology has evolved. But as the Information Age has disrupted the normally proportional relationship between space, time, and force; operational art has not evolved. Axioms such as trading space for time, or size of space dictating size of force, are more subject to chaotic outcomes in the Information Age, due to the compression of all three factors of space, time, and force.[39] Chaotic outcomes when

[36] Thackray, "The Holy Grail," 47. ". . . cognitive dominance. This is the condition where superior decisions and consequent battlespace actions . . . create conditions where the adversary is frozen out of all options at all levels and is reduced to a condition of decision paralysis, cognitive inferiority and near perpetual surprise"; Cebrowski, "Network-Centric Warfare: Its Origin and Future," 28-35.
[37] Dahl, "Network Centric Warfare and the Death of Operational Art," 5.
[38] Cebrowski, "Network-Centric Warfare: Its Origin and Future," 28-35.
[39] Dahl, "Network Centric Warfare and the Death of Operational Art," 5.

modeling warfare as a system are defined by standard inputs not necessarily yielding predictable outputs.[40]

The acknowledgement that the Information Age would result in an unpredictable chaos is what Admiral Cebrowski attempted to articulate in his discussion of modern warfare moving past linear definitions and understandings.[41] Recognizing the chaos that is described as non-linear warfare, *Mission Command* emphasizes the importance of the commander's intent encompassing all phases and aspects of the operation; as mission type orders are more resilient and adaptable than traditional plans.[42] The use of NCW inside a culture of mission command may create a warfighting network of forces that are more complex and adaptable than any central headquarters could plan, much less micro-manage.[43] A warfighting network of forces operating off mission type orders can be synonymous with a force being described as distributed and decentralized.

Emergent capabilities for effects that Cyber forces, Military Information-Support Operations (MISO) forces, and SOF highlight is the evolution in operational art networked forces can precipitate. These forces are positioned to operate with mission type orders due to the scope of their effects. These forces are routinely entrusted to observe, orient, decide, and act to achieve the desired end state articulated in a commander's intent; focusing more on the level of effect to be achieved than on the level of action to be executed.[44]

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[40] Kolenda, "Transforming How We Fight: A Conceptual Approach." 108. As an example, with time and space both being compressed, the normal idea of giving ground in a defense to gain time to mount an offense can become untenable. The defender could give ground, only to discover that time was compressed, and the ceding of ground did not allow time to mount counter or spoiling attacks. Similarly, a force could have an expansive space to cover and assume that it would need an expansive force- but now small effective forces are being leveraged to effect large spaces.
[41] Cebrowski, "Network Centric Warfare," 28-35.
[42] Dempsey, *Mission Command,* 5.
[43] Kolenda, "Transforming How We Fight: A Conceptual Approach," 110.
[44] Dempsey, *Mission Command,* 3-4. Effects Based Operations is a military theory dealing with what aspects of an enemy can be targeted to maximize effects while minimizing damages. Its relevance to this paper is

This juxtaposition of the principles of NCW and the principles of the Joint Force 2020 reveals the following imperatives are common throughout: shared situational understanding and context, forces working horizontally as a self-synchronized and self-organized unity of effort, and decentralizing commands in order to gain an advantage in speed of command. The fusion of mission command and the integration of emergent technologies can enable shared situational understanding, unity of effort, and decentralized command.

NCW FORCES EVOLVING INTO THE JOINT FORCE 2020

The issue is that, until recently, all of this would have been theorization. Now forces are beginning to institute and codify TTPs that are rooted in NCW. The evolving nature of MISO, with its mandate to be timely to be relevant, can be an example of networked forces trying to evolve into the Joint Force 2020. It is arguable that the current enemy dominates the information domain with more timely and effective propaganda than the US Military.[45] One reason for this may be the hierarchical approval process for the release of information by the US Military to the public. The synthesis of mission command and NCW implies that commanders at all levels of war in Joint Force 2020 should organically plan and execute MISO.[46]

Likewise, Cyber operations are a burgeoning reality of the Information Age. Sharing the same command organization issue as MISO, the ability of commanders at all levels of

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ancillary, but it can be noted that NCW would enable EBO if that method of engagement/targeting is preferred at the time.

[45] Tim Foxley, "Countering Taliban Information Operations in Afghanistan," *Prism* 1, no. 4: 79-94 http://cco.dodlive.mil/files/2014/02/Prism_79-94_Foxley.pdf. 79-80.

[46] Currently, military Public Affairs Officers at O6 and above commands conduct the majority of IO. There is debate on how to use PAO in concert with MISO, and at what levels of command, and by what personnel, MISO and PAO should be conducted.

war to effect Cyber relies on vertical coordination through a hierarchy to leverage an adjacent command to decide and act. This command organization is effectively forcing commanders to go up their chain of command, for the decision to coordinate laterally with a subordinate unified command to elicit action. This command organization is not in the spirit of mission command, as it limits an on ground commander's ability to effect domains that can have an effect on the operation.

SOF are typically highlighted as a force that can operate in a distributed and decentralized nature.[47] Enabling the decentralization and distribution of SOF is the connection of the forces into a greater SOF network. Empowered through Metcalfe's Law, the network's power lies in the connection of the various decentralized and distributed forces.[48] The connections allow small teams in isolated spaces to have access to national intelligence resources; to levy the entire power of the network at a single space and point in time.[49] If these forces were not networked, their effectiveness would diminish. As well, development of a Common Operating Picture (COP) is being leveraged to create shared situational understanding. The horsepower behind the COP is the ability to manipulate metadata produced by any force with a GPS enabled navigation system.[50] This metadata allows all networked forces to see other networked forces in graphic displays.[51] The communications infrastructure supporting the messaging of metadata can be leveraged to

[47] U.S. Special Operations Command, *United States Special Operations Command 2020, Forging the Tip of the Spear*, (MacDill AFB, FL: Public Affairs Office), 2-4. http://www.defenseinnovationmarketplace.mil/resources/SOCOM2020Strategy.pdf.
[48] Cebrowski, "Network-Centric Warfare: Its Origin and Future," 28-35.
[49] Dana Priest and William M. Arkin, "'Top Secret America': A look at the military's Joint Special Operations Command," *Washington Post*, September 2, 2011. http://www.washingtonpost.com/world/national-security/top-secret-america-a-look-at-the-militarys-joint-special-operations-command/2011/08/30/gIQAvYuAxJ_story.html, accessed May 11, 2014.
[50] Master Sergeant Edward Priest, "Universal Combat Data-link Integration System" (white paper, 724 STG A-8T, Fort Bragg, NC, 2013): 2-3.
[51] Ibid.

support other messaging and data sharing, making it possible for special operators to reach into their higher headquarters to grab the intelligence they need to better observe, orient, decide, and act at their level of war.

CONCLUSION

Already, the amount of information passed by mobile users exceeds that of stationary users.[52] It is for this reason that the Joint Staff has adopted programs to exploit industry's edge on mobile computing.[53] The commander and the headquarters staff on the ground will soon be able to view the full motion video from networked assets. The commander on the ground will soon be able to view in real time the distribution of his forces, as well as that of his supporting and adjacent commanders. The commander on the ground will soon be able to move towards the sound of the guns while remaining connected directly into his staff's information systems at static sites in the rear, providing him up to date intelligence without operational pause.

The Joint Force 2020 directs the force to move in this direction. It calls for mission command to allow leaders to make decisions and act on them. The Joint Force 2020 demands forces be agile and efficient but also decisive and effective. Leveraging the principles of NCW will provide leaders a way ahead of what technology to procure and how to employ it to indoctrinate mission command, and evolve into the Joint Force 2020.

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[52] Joseph Menn, "Smartphone Shipments Surpass PCs," *Financial Times*, February 8, 2011. http://www.ft.com/cms/s/2/d96e3bd8-33ca-11e0-b1ed-00144feabdc0.html#axzz2zq3A1nIl, accessed April 24, 2014.

[53] Master Chief Petty Officer Chris Vertin, Lieutenant Colonel Scott Brooks, and Lieutenant Colonel Dave Hernandez, "4G Will Get You 10X," www.afcea.org, August 1, 2013, accessed April 23, 2014. http://www.afcea.org/content/?q=node/11451.

THREE RECOMMENDATIONS

Looking at how the principles of NCW are relevant to the evolution of today's military into the Joint Force 2020, certain imperatives come to the surface. First, emphasis on adapting emerging technology to fit the purpose and intent of mission command as it pertains to the Joint Force 2020 will need to be fostered. Second, the drive to procure technology should focus more on what on-the-ground fighters need to allow extension of the network to the furthest edges of the battlefield. Lastly, the education of commanders will need to experience a paradigm shift to encourage a command climate of mission command, which is necessary for the Joint Force 2020.

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